

WHAT IS CLAIMED IS:

1 1. A man-machine interface method for permitting a user
2 to act on thumbnails, each thumbnail representing an
3 associated object containing information, for use with a
4 machine having a video display device and a user input
5 device, the man-machine interface method comprising:

6 a) generating a three-dimensional environment,
7 having a depth, to be rendered on the video display
8 device;

9 b) determining a two-dimensional location and a
10 depth of each of the thumbnails in the
11 three-dimensional environment, wherein, for each of
12 the thumbnails, the depth is a function of at least
13 one parameter of the object associated with the
14 thumbnail; and

15 c) generating the thumbnails within the
16 three-dimensional environment, at the determined
17 two-dimensional locations and depths, to be rendered
18 on the video display device.

1 2. The man-machine interface method of claim 1 wherein,
2 for each of the thumbnails, the depth is a linear
3 function of at least one parameter of the object
4 associated with the thumbnail.

1 3. The man-machine interface method of claim 1 wherein,
2 for each of the thumbnails, the depth is a polynomial

1 4. The man-machine interface method of claim 1 wherein,
2 for each of the thumbnails, the depth is an exponential
3 function of at least one parameter of the object
4 associated with the thumbnail.

1 6. The man-machine interface method of claim 1 further
2 comprising:

3 d) accepting inputs from the user input device;
4 e) determining a two-dimensional cursor location
5 based on the accepted inputs; and
6 f) generating a cursor at the determined
7 two-dimensional cursor location, to be rendered on
8 the video display device.

1 7. The man-machine interface method of claim 6 further
2 comprising:

1 8. The man-machine interface method of claim 7 further
2 comprising:

1 9. The man-machine interface method of claim 7 further
2 comprising:

1 10. The man-machine interface method of claim 7 further
2 comprising:

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3         h) if the user input provides a float input and if
4         an active thumbnail exists, then setting the depth
5         of the active thumbnail to a predetermined value and
6         defining a state of the active thumbnail as floated.

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1 11. The man-machine interface method of claim 9 wherein
2 the act of generating the higher resolution visual
3 representation of the object represented by and
4 associated with the active thumbnail includes:

5 - generating an animation which moves the
6 higher resolution visual representation of the
7 object represented by and associated with the
8 active thumbnail from the location of the
9 active thumbnail to the preferred viewing
10 location at the foreground of the three
11 dimensional environment, to be rendered on the
12 video display device.

1 12. The man-machine interface method of claim 11 further
2 comprising:

3 i) if the user input provides a deselection input
4 and if a selected thumbnail exists, then generating
5 a video output for moving the high resolution visual
6 representation of the object represented by and
7 associated with the active thumbnail to the
8 two-dimensional location of the selected thumbnail,
9 to be rendered on the video display device.

1 13. The man-machine interface method of claim 9 further
2 comprising:

3 i) if the user input provides a sink input and if a
4 floated thumbnail exists, then setting the depth of

5 the floated thumbnail to a previous value and
6 defining a state of the floated thumbnail as active.

1 14. The man-machine interface method of claim 7 further
2 comprising:

3 h) if the user input provides a selection input and
4 if an active thumbnail exists, then

5 i) invoking an application related to the
6 object represented by and associated with the
7 active thumbnail,

8 ii) loading the object represented by and
9 associated with the active thumbnail into the
10 application, and

11 iii) generating a video output of the
12 application with the loaded object represented
13 by and associated with the active thumbnail at
14 a preferred viewing location, to be rendered on
15 the video display device.

1 15. The man-machine interface method of claim 9 further
2 comprising:

3 h) if the user input provides a selection input and
4 if a floated thumbnail exists, then

5 i) invoking an application related to the
6 object represented by and associated with the
7 floated thumbnail,

8 ii) loading the object represented by and
9 associated with the floated thumbnail into the
10 application, and
11 iii) generating a video output of the
12 application with the loaded object represented
13 by and associated with the floated thumbnail at
14 a preferred viewing location, to be rendered on
15 the video display device.

16. The man-machine interface method of claim 7 further
comprising:

h) if the user input provides a move input and if
an active or floated thumbnail exists, then
i) updating the two-dimensional location of
the active or floated thumbnail based on the
move input.

17. The man-machine interface method of claim 16 wherein
the move input is a left button mouse drag.

18. The man-machine interface method of claim 1 wherein
the three-dimensional environment defines a foreground
and a background, and
wherein the act of generating thumbnails, within the
three-dimensional environment, at the determined
two-dimensional locations and depths, to be rendered on
the video display device, includes:

8 i) using perspective views so that any thumbnails
9 in the foreground defined by the three-dimensional
10 environment appear larger than any thumbnails in the
11 background defined by the three-dimensional surface.

1 19. The man-machine interface method of claim 18 wherein
2 a thumbnail partially occludes any thumbnails behind it,
3 based on a viewing point.

1 20. The man-machine interface method of claim 1 further
2 comprising:

3 d) accepting inputs from the user input device;
4 e) determining a viewing point two-dimensional
5 location, depth and direction based on the accepted
6 inputs; and
7 f) generating only that portion of the
8 three-dimensional environment and only those
9 thumbnails that are in front of the virtual viewing
10 point determined in act (e), to be rendered on the
11 video display device.

1 21. The man-machine interface method of claim 1 wherein
2 the thumbnails are low resolution bit maps.

1 22. The man-machine interface method of claim 21 wherein
2 the low resolution bit maps are 64 pixels by 64 pixels
3 and have 24 bit color.

1 23. The method of claim 20 wherein if the depth of the
2 viewing point is below a predetermined depth, further
3 performing a step of:

4 g) gradually decreasing the depth of the viewing
5 point to float the viewing point while no user
6 inputs are received.

1 24. The method of claim 1 further comprising, for each
2 of the thumbnails, determining a shade to be applied to
3 the thumbnail based on its depth.

1 25. The method of claim 24 wherein the shade to be
2 applied to the thumbnail darkens as the depth increases.

1 26. The method of claim 24 wherein the shade to be
2 applied to the thumbnail darkens as a distance between
3 the depth of the thumbnail and a viewing point increases.

1 27. The method of claim 1 further comprising, for each
2 of the thumbnails, determining a fade to be applied to
3 the thumbnail based on its depth.

1 28. The method of claim 27 wherein the fade to be
2 applied to the thumbnail increases as the depth
3 increases.

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1 34. A system which permits a user to interact with
2 thumbnails, each thumbnail representing an associated
3 object containing information, the system comprising:
4 a) an input facility for accepting user inputs;
5 b) a storage facility containing
6 i) a two-dimensional location, a depth and
7 state information for each of the thumbnails.

- 8 ii) a two-dimensional cursor location, and
9 iii) a three-dimensional environment having a
10 simulated depth;
11 c) a processing unit which
12 i) accepts user inputs from the input
13 facility,
14 ii) updates (a) the two-dimensional location,
15 and state information for each of the
16 thumbnails contained in the storage facility,
17 and (b) the two-dimensional cursor location
18 contained in the storage facility, based on the
19 accepted user inputs,
20 iii) updates depth information for each of the
21 thumbnails contained in the storage facility
22 based on at least one parameter of the object
23 associated with the thumbnail, and
24 iv) generates video outputs based on
25 A) the two-dimensional location, depth
26 and state information for each of the
27 thumbnails,
28 B) the two-dimensional cursor location,
29 and
30 C) the three-dimensional environment,
31 contained in the storage facility; and
32 d) a video display unit for rendering the video
33 outputs generated by the processing unit.

1 35. The system of claim 34 wherein the state information
2 for each of the thumbnails contained in the storage
3 facility includes an indication of whether or not the
4 thumbnail is active, and

5 wherein the processing unit determines that a
6 thumbnail is active if a cursor is located on or over a
7 thumbnail based on the two-dimensional location of the
8 cursor and the two dimensional location of the thumbnail.

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1 36. The system of claim 35 wherein the storage facility
2 further contains descriptive textual information for each
3 of the thumbnails, and

4 wherein, if a thumbnail is active,

5 i) the processing unit generates a pop-up bar,
6 based on descriptive textual information, for
7 the active thumbnail, and

8 ii) the video display unit renders the pop-up
9 bar over the rendered t.

1 37. The system of claim 35 wherein, if a thumbnail is
2 active or floated and the input facility accepts a
3 selection input, then

4 i) the processing unit updates the state of
5 the thumbnail,

6 ii) the processing unit gets a second, higher
7 resolution, visual representation of the object
8 represented by and associated with the
9 thumbnail,

10 iii) the processing unit generates a video
11 output based on the higher resolution, visual
12 representation of the object represented by and
13 associated with the thumbnail at a preferred
14 viewing location, and
15 iv) the video display device renders the video
16 output generated by the processing unit.

1 38. The system of claim 37 further comprising an audio
2 output device,

3 wherein the storage facility further contains a
4 first audio cue, and

5 wherein, when an object is selected, the processing
6 unit provides the first audio cue to the audio output
7 device.

1 39. The system of claim 37 wherein each thumbnail is a
2 64 pixel by 64 pixel bit map having 24 bit color and
3 wherein each higher resolution, visual representation of
4 the objects is a 512 pixel by 512 pixel bit map having 24
5 bit color.

1 40. The system of claim 37 wherein the processing unit
2 further effects a video output based on an animation of
3 the higher resolution, visual representation of the
4 object represented by and associated with the thumbnail,
5 moving from the location of the thumbnail to a location
6 at the foreground of the three-dimensional environment.

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1 41. The system of claim 35 wherein if the input facility
2 provides a float input and an active thumbnail exists,
3 then the processing unit will set the depth of the active
4 thumbnail to a predetermined value and will define the
5 state of the active thumbnail as floated.

1 42. The system of claim 35 wherein, if a thumbnail is
2 active and the input facility accepts a selection input,
3 then

- 4 i) the processing unit updates the state of
5 the thumbnail to selected,
6 ii) the processing unit opens an application
7 with which the object, associated with and
8 represented by the selected thumbnail, is
9 associated,
10 iii) the processing unit loads the object into
11 the application,
12 iv) the processing unit generates a video
13 output based on the object loaded onto the
14 opened application and a preferred viewing
15 location, and
16 v) the video display device renders the video
17 output generated by the processing unit.

1 43. The system of claim 41 wherein if the input facility
2 provides a sink input and if a floated thumbnail exists,
3 then the processing unit will set the depth of the

4 floated thumbnail to a previous value and will define a
5 state of the floated thumbnail as active.

1 44. The system of claim 37 wherein, if a thumbnail is
2 active or floated and the input facility accepts a move
3 input, then

- 4 i) the processing unit updates the state and
5 location of the thumbnail,
6 ii) the processing unit generates a video
7 output based on the updated location of the
8 thumbnail, and
9 iii) the video display device renders the
10 video output generated by the processing unit.

1 45. The system of claim 35 wherein if a thumbnail is
2 floated and the input facility accepts a selection input,
3 then

- 4 i) the processing unit updates the state of the
5 thumbnail to selected,
6 ii) the processing unit opens an application with
7 which the object, associated with and represented by
8 the selected thumbnail, is associated,
9 iii) the processing unit loads the object into the
10 application,
11 iv) the processing unit generates a video output
12 based on the object loaded onto the opened
13 application and a preferred viewing location, and

14 v) the video display device renders the video
15 output generated by the processing unit.

1 46. The system of claim 34 wherein the storage facility
2 further contains virtual viewing point location
3 information,

4 wherein the input facility includes a mouse, and
5 wherein the processing unit

6 d) accepts inputs from the user input device;

7 e) determines a viewing point location and
8 direction based on the accepted inputs; and

9 f) generates only that portion of the
10 three-dimensional environment and only those
11 thumbnails that are in front of the virtual viewing
12 point determined in step (e), to be rendered on the
13 video display device.

1 47. A machine readable medium containing data and
2 machine executable instructions which, when executed by a
3 machine, performs the method of claim 1.

1 48. A machine readable medium containing data and
2 machine executable instructions which, when executed by a
3 machine, performs the method of claim 6.

1 49. A machine readable medium containing data and
2 machine executable instructions which, when executed by a
3 machine, performs the method of claim 7.

1 50. A machine readable medium containing data and
2 machine executable instructions which, when executed by a
3 machine, performs the method of claim 8.

1 51. A machine readable medium containing data and
2 machine executable instructions which, when executed by a
3 machine, performs the method of claim 9.

1 52. A machine readable medium containing data and
2 machine executable instructions which, when executed by a
3 machine, performs the method of claim 10.

1 53. A machine readable medium containing data and
2 machine executable instructions which, when executed by a
3 machine, performs the method of claim 11.

1 54. A machine readable medium containing data and
2 machine executable instructions which, when executed by a
3 machine, performs the method of claim 12.

1 55. A machine readable medium containing data and
2 machine executable instructions which, when executed by a
3 machine, performs the method of claim 13.

1 56. A machine readable medium containing data and
2 machine executable instructions which, when executed by a
3 machine, performs the method of claim 14.

50. A machine readable medium containing data and machine executable instructions which, when executed by a machine, performs the method of claim 8.

1 57. A machine readable medium containing data and
2 machine executable instructions which, when executed by a
3 machine, performs the method of claim 15.

1 58. A machine readable medium containing data and
2 machine executable instructions which, when executed by a
3 machine, performs the method of claim 18.

1 59. A machine readable medium containing data and
2 machine executable instructions which, when executed by a
3 machine, performs the method of claim 19.

1 60. A machine readable medium containing data and
2 machine executable instructions which, when executed by a
3 machine, performs the method of claim 20.

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